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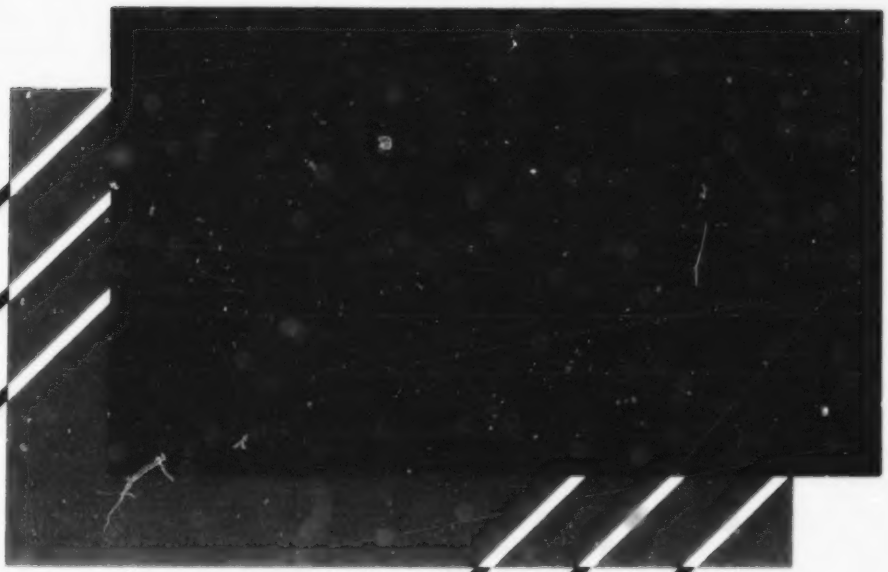

Canada

IMPACT OF TECHNOLOGY IN THE WORKPLACE

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ABSTRACT

Human resources management professionals must be aware of technology that has had or will have a significant impact on productivity in the tertiary sector: office automation, decision support systems, expert systems, artificial intelligence - all of these affect the nature of work.

Studies on the subject indicate, however, that anticipated gains in productivity are not always achieved. The purpose of this presentation is to show that technology in itself is neither good nor bad; all depends on how it is implemented and how decisions are applied. We will discuss the proven and potential impact of office automation and explain how certain measures, decisions and actions can be taken to maximize the benefits of automation.

We will therefore examine how change is implemented in the office of today and how the office of the future - the office of the 1990s - will be managed. We will describe the experience of several innovative organizations that are already operating in a sophisticated technological environment to which their management philosophy has been adapted. We will also discuss relevant research findings and work carried out at the Canadian Workplace Automation Research Centre. Finally, we will propose a series of practical solutions that will make it easier to tame computer technology and to benefit from its full potential.

INTRODUCTION

Since the beginning of human society, the nature of work has been undergoing periodic transformations. We need only mention the creation of the first tools, the invention of the plough and more recently the development of the internal combustion engine.

These technological changes required considerable human adjustment, whether in terms of apprenticeship, training, or working environment. This is also true of computer technology. In the past few years, not only our working environment but our entire socio-economic system has been transformed. This has been the case in every transition period since the industrial revolution of the 19th century when industrial capitalism replaced the old mercantile system. The way we work, our organizational structures, the way we make decisions, the way we communicate and the knowledge connected with our work are constantly evolving.

The transformation of our working environment will not be without impact. People cannot be overlooked during this period because <u>they</u> are the factor of production in the tertiary sector. Information is <u>in people</u>.

An entire generation of workers is unprepared for this change. Job profiles are changing and certain jobs will increasingly require training that is radically different from that in the past.

A great challenge faces human resources managers. If they learn to manage change - and that is how they can become indispensable agents of change - then the human and organizational impact during a transition period (in other words, today) can be softened.

Tomorrow, however, the aim will not be to soften the impact but to achieve excellence through the best possible co-ordination

of system processes within the organization: changes in management style and in the division and nature of tasks; basic and on-going training in varying proportions; centralization / decentralization ratio, etc.

With the support of human resources managers, businesses and workers will be able to reap the maximum benefits of automation.

1. A SOCIAL REALITY

A changing world

We must recognize that change is an intrinsic part of our life and our work. We are constantly faced with the challenge of absorbing and adapting to new activities, new procedures and new tools. Everything is in perpetual flux. What will we be doing in five years? What will the organizational structure be like? Who will be our colleagues, our superiors? What will our jobs be like? In these times of rapid change and uncertainty, our future is difficult to predict.

Similarly, a number of factors have changed the labour market in the past twenty-five years. Among the major changes, one must mention the development of the service sector and the introduction of new technology.

An information economy

Currently over seven out of ten employees work in the service sector. A large proportion of these employees holds information-related jobs. At the root of all these changes, therefore, lies the concept of information. Information is the driving force behind a great many economic, social and individual activities. In 1951, approximately 30 per cent of jobs in the United States were related to information; the proportion leaped 16 per cent in thirty years to reach 46 per cent in 1981. Such jobs are now growing at a rate of 10 per cent a year, or three times faster than the population.

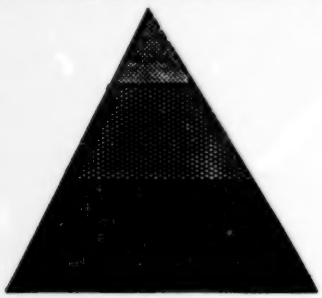
2. AN ORGANIZATIONAL REALITY

The information explosion has resulted, in organizational terms, in the rapid growth of middle-level positions. Figure 1 shows that the structure of organizations has changed substantially: organizations were traditionally structured like a pyramid, with few managers at the top and many workers at the bottom. Today, according to Brown and Weiner, the structure is closer in shape to an egg, with fewer people at the top and bottom and a large number of middle-level employees. The authors suggest that technological change will further modify organizational structure by eliminating many middle jobs to create an hourglass shape.

FIGURE 1

EVOLUTION OF ORGANIZATIONAL STRUCTURES

Traditional pyramid structure



- Few executives
- Many middle managers and foremen
- Many white-collar, blue-collar and clerical employees

Egg-shaped structure

- Fewer executives and senior managers
- More white-collar employees
- Fewer blue-collar and clerical employees

Hourglass structure

- More executives and senior managers
- Few middle-level jobs
- Many white-collar employees

These structural changes can all be attributed largely to the fact that computers and machines are taking over work usually assigned to clerical staff. As a result, if the number of office workers shrinks, so do the related managerial and administrative support functions.

The solution: automation

The way in which information is used and processed is closely tied to technology. There are many potential applications of new information technology. Since the introduction of transistors close to forty years ago, the appearance of microprocessors at the beginning of the sixties and the recent development of integrated circuits, we have seen more and more new products and processes that continue to expand the capabilities of machines. The latest developments include parallel processors such as a connection machine capable of handling 65,656 parallel operations, fibre optics and superconductors.

A 1986 study of small businesses in the United States found that 86 per cent of the firms owned microcomputers and that over 75 per cent were satisfied with their systems. Computers are therefore playing a major role in all types of businesses, regardless of size. Use of computer technology has become widespread and is no longer the exclusive preserve of experts and technicians. According to the magazine Inc., there are now more than 13 million personal computers on the American market.

Implementation of technology

Needless to say, computer technology is considered important, even vital, for processing the mass of information handled by businesses. Once implemented, however, new technology has often failed to meet expectations. Users describe conflicting experiences:

IMPLEMENTATION OF TECHNOLOGY

NEGATIVE IMPACT	POSITIVE IMPACT
.Allows a few specialized people to monopolize knowledge	.Gives more people access to knowledge and information
.Eliminates jobs, makes some occupational training obsolete and increases retraining needs	.Creates new jobs, provides challenges and opportunities to learn and advance
.Makes jobs monotonous and repetitive; increases control	.Helps create variety, allows independence and encourages judgment and innovation
.Provides a pretext to centralize organizational structure even more	.Helps to open up, decentralize and democratize business activities

Seeking a new balance

Productivity gains are not achieved simply by mastering computer technology. Technological development alone guarantees neither economic growth nor business competitiveness. Such development must be combined with management of related social and human changes in order to optimize business activities. The technical and human elements are not separate or distinct, but must be developed jointly.

Automation strategies lead to the identification of technical and organizational alternatives. Together with the evolution of software and computer equipment, we are also witnessing the development of implementation methods. Successful implementation of information technology depends on various organizational and social factors, such as:

(a) Participation of human resources managers in the development and planning of system implementation.

Employees are the key to successful automation. Human resources managers must get involved and ensure that greater financial resources are invested in personnel development during a company's technical transition. Canadian businesses must use the opportunity for change created by the implementation of information technology to review their administrative procedures and activities.

(b) Employee training and development

The restructuring of jobs made necessary by new technology requires employees to adapt continually. Proper training makes their adjustment easier. The sums invested in the management of human resources must be equal to, if not greater than, those allocated for purchasing and developing hardware and software. Employee training and retraining are essential if new technology is to be used effectively and to its full potential. During the office automation process, establishing a training and retraining program makes it possible to develop qualified employees, thus providing the company with skilled manpower.

These factors must be considered alongside technical ones because they help businesses to derive the maximum benefits from new technology.

3. A DEPARTMENTAL REALITY

It is important to understand the process of technological implementation. The equipment is only an accessory. Planning, consultation, information, training, continued apprenticeship and project evaluation are essential. The success or failure of automation, the positive or negative consequences of using new technology, depend on management's approach from the very beginning. Technology alone offers no strategic advantages or guaranteed productivity gains. Computer equipment does not lead to more efficient operations unless used correctly by a motivated worker who wants to get the maximum out of it and feels personally committed to the objectives of his group or organization.

The changing organization of work

Unfortunately, the terms implementation and installation are often confused. Several case studies describe situations in which computer equipment was installed without prior analysis of working procedures, and with no examination of needs or organizational diagnosis. Often employees receive only the standard functional training provided by the manufacturer. It becomes clear that improvements in productivity and performance do not reflect the resources invested in technology but those invested in the organization of work.

The main problem with the "installation" approach is that it perpetuates the existing organization of work. It ossifies procedures and maintains the status quo, leading to a drop in performance. In some cases, employees maintain a manual system alongside the automated system because they are uncomfortable with the new tool.

The preliminary results of a current Canadian Workplace Automation Research Centre study show the importance of restructuring the content of tasks and revising working procedures. The study measures the number of redundant documents and forms currently circulating in bureaucratic organizations. Analysing the flow of information and processes before automation reduces the number of documents by half and cuts costs accordingly.

At the beginning of an automation project, a multidisciplinary team of systems analysts and personnel management experts must work to reorganize administrative tasks and activities, or at least anticipate such changes. The implementation of technology must be part of a complex process in which human resources specialists are responsible for improving information circuits, transferring activities and distributing work differently, using the skills of those who are actually experiencing office automation and maintaining an open dialogue with them.

A comprehensive approach to automation

The automation process must therefore include an analysis of work. This analysis must focus mainly on the content of work and not on the way in which it is carried out. The content of work can usually be determined by asking questions such as: What information is used? How is it organized, modified, transmitted? What constraints does the work impose? Based on those questions, the human resources manager must evaluate the changes in the organization of work. Is there another way to divide up work? Are qualification and skill requirements changing? Should line relationships and organizational structure be modified?

It is also necessary to validate the needs expressed. Too often the needs perceived by users are not real but rather a reflection of what they have read. They must therefore be validated.

In the context of technological change, Taylor's principle of the division of work is outdated. This principle consisted in reducing work to the performance of specific tasks requiring no particular skill or knowledge. In contrast, the new organization of work is based on integrated tasks and versatile skills. The concepts of teamwork, multifaceted jobs and varied tasks are becoming increasingly important.

Even more than in the secondary sector, the organization of work in the tertiary sector favours the creation of small, semi-autonomous work teams; it also favours decentralization thanks to the development of electronic communications. The result is a flexible organization that helps workers to adapt. Other innovations in the field of human resources management concern the retraining of workers. This aspect will be discussed later. The new approach to the organization of work is termed socio-technical: it consists in merging the psychological and social needs of employees with a company's technological requirements and productivity objectives.

Logical training

The new ways of organizing work favour flexibility and employee adaptability. Work is too often reduced to the performance of set routines. Automation must not perpetuate this rigid organization but must lead to a flexible environment in which employee potential can be developed. Training and retraining are part of the solution (far more than the problem!).

Too often the training of employees is limited to standard instruction in the operation of a tool. This is a very short-sighted approach. One of the consequences is the inability to understand what happens behind the screen. If the employee does not possess the necessary formal knowledge of logic, he is forced to adapt to the tool without understanding how it works. This

makes it difficult for the employee to transfer his newly acquired skills to other equipment and software. A second drawback is that this limited understanding of computer logic prevents the employee from exploring the potential applications of new technology on his own. Because of his inability to stand back and assess the tool he uses and the work he performs, the employee cannot develop other work methods and thereby improve his efficiency and productivity.

This idea of providing training based on logical understanding as a prelude to functional training has led to the restructuring of the office technology training program at the CEGEP level in Quebec. CWARC was involved in designing Analysis and problem solving, a refresher course for office technology teachers. The course promotes the teaching of information concepts, diagnosis systems, models and problem-solving. As a result, office workers will acquire a logical understanding of the flow of information in their organizations. They will be better able to master and control their activities and thus become more involved and innovative in their work.

Acquisition of knowledge must be considered a decisive factor in the successful implementation of technology. Training is a means of developing the ability to think logically, to work independently and to innovate. A well-trained employee will not submit passively to the imposition of new equipment but will be actively involved in adapting his activities step by step to a task requiring new knowledge and to a more efficient organization of his work. For this to be possible, however, the organization of work must allow a certain leeway.

A recent study by the Work in America Institute provides quantitative proof that during a technological transition it is better to train existing employees than to replace them with new ones. The study shows that the cost of retraining and thus pro-

viding job stability is often less than the cost of laying off workers and hiring others who are already trained. By dismissing employees whose skills are redundant, a business loses vital assets such as loyalty, experience, flexibility, organizational continuity and corporate memory. The study describes the experiences of some of the largest American corporations where retrained employees had no problems fitting into their new work units.

An experiment at Customs and Excise showed that employees should not be placed in an environment where they cannot innovate. When an employee is given more powerful work tools, he must be allowed to experiment.

The level of motivation and the degree of innovation are determined by organizational philosophy. Employee development opportunities are determined by human resources management policy.

Recognizing human potential

In a changing environment, the competitiveness of a company is often measured in terms of its reaction and adjustment speed. These qualities depend on the presence of a motivated staff. Now that the most sophisticated equipment is becoming obsolete within five or ten years (eight to ten years for mainframe computers, but far less - maybe two years - for PCs and other equipment), the concepts of personnel flexibility and adaptability are vital to the growth of businesses. Their motto must be: "invest first in human resources".

4. AN INDIVIDUAL REALITY

Hardware is growing increasingly sophisticated. The design and use of software, meanwhile, is becoming simpler. Integrated computer and communications systems now make it possible to link various equipment and to divide up data and applications. Organizations are dealing with distributed systems. This democratization can have a positive impact at the management level of organizations. As the work of managers changes, human resources management must play a deciding role.

Impact on management productivity

Until now, automation has affected mainly office support staff. We have witnessed a decline in demand for support staff. A recent study shows that an employee using a word processor is equivalent on average to 1.8 employees using ordinary typewriters, and the productivity ratio reaches 2.43 to 1 for large businesses with over 500 employees. The next phase of office automation will involve the installation of integrated work stations for all staff members.

Before long, professionals and managers will be using these tools. One must anticipate that technology will lead to a restructuring of management and administrative work.

Automation of support functions was aimed mainly at increasing productivity in the strict sense of the word. Automation of management work cannot restrict itself to such a quantitative objective and must include qualitative objectives because of the nature of a manager's role. Technology allows managers to change their methods and improve the quality of their output. The new management work structure must be flexible to

permit spontaneous innovation and "intrapreneurship" [1].

A further phase of technological implementation will reach the upper levels of organizations. Decision support systems and expert systems will become valuable planning and management tools.

According to Mintzberg (1984), managerial work consists mainly of information processing (40% of time), decision-making (21%), requests (18%) and various secondary activities (21%). The introduction of computer technology will lead to major changes in the way these tasks are performed:

a) Information processing:

Integrated hardware and software will make it easier to circulate information by reducing transmission time and the number of intermediaries. This will boost productivity in this area.

b) Decision-making:

The cost reduction that computer technology helped bring about by automating clerical tasks is likely to be achieved in management work as well thanks to artificial intelligence and expert systems. The latter are a form of software that can perform highly specialized and complex professional tasks. These systems often outperform human experts because their operation is based on a range of knowledge so vast as to be beyond human capacity.

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[1] From the term "intrapreneur". Entrepreneurship by employees within their companies. Employees are allowed to innovate and make profitable use of their time by pursuing activities that benefit the company and also, in terms of experience and expertise, the employee.

Expert systems can be considered prostheses for human intelligence. They will give more people access to the information and knowledge needed for decision-making. They can be used, for instance, in staffing, in medicine, in law, in mine prospecting and oil exploration. These systems are extremely useful in situations where a multitude of variables makes decisions difficult, risky, and often costly in case of error.

Impact on human resources management

At this stage of technological change and its impact on our working environment, human resources specialists have yet to design methods for managing technical developments, or precise personnel management models. Up until now, experts have commented mainly on the effects of technology, but very little on how to manage change. We would like to urge personnel managers to take the initiative in the early phases of technical projects in order to provide their organizations with a favourable environment for the design, production and dissemination of technological innovations.

CONCLUSION

Man has been adapting to change for centuries. The discoveries of the past few decades, however, have brought about unprecedented social, technological and economic transformations. These changes greatly affect our working environment and this is why we cannot improvise change.

The information society is a very demanding one. Without strategic support from experts of all kinds, and without lucid action by those who must manage change, we risk creating effects that may jeopardize the adjustment or transformation of our businesses. Among these experts, the human resources manager plays a fundamental role in that he deals with a company's most important resource, but also its most vulnerable in a period of technological change: people.

Automation changes the organization of work, its content and, consequently, job requirements. It is in this respect that employees become a critical asset to a company in its efforts to grow. New technological developments encourage us to rethink our personnel management practices. It is therefore essential to develop new approaches in order to meet staff and organizational needs. To achieve these goals, businesses will need to rely more and more on human resources specialists.

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